

The University of Michigan  
College of Engineering  
Curriculum Committee  
Faculty Meeting Report  
February 23, 2010

Agenda Items

For Vote

Evaluation and Approval of Change from CUGS Program to SGUS for Computer Science and Engineering (CSE)

AOSS Program Change: Establish a New Departmental Concentration



College of Engineering  
Department of Electrical Engineering and Computer Science  
**Computer Science and Engineering**  
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## MEMORANDUM

**TO:** CoE Curriculum Committee

**FROM:** John P. Hayes  
Chair, CSE Graduate Committee

**SUBJECT:** Evaluation and approval of change from CUGS program to SGUS for  
Computer Science and Engineering (CSE)

**DATE:** February 4, 2010

This request is for a change from the CUGS program to the SGUS program, which is currently used by all programs in COE (except EECS). We ask to change the CSE program to match the majority of the COE programs and to offer more options to our undergraduate students.

This change in program will solve some of the disadvantages of the CUGS program, such as:

More choice of courses to double count.

The student will not be dually enrolled, but will “transfer” the course(s) to be used toward the master’s degree. SGUS allows them to pick courses from any term of their undergraduate program, not just the term in which they are officially in the SGUS program.

Loss of financial aid with CUGS is not an issue with SGUS.

Under CUGS rules, an undergraduate student can lose funding by adding an active masters-level program. This can make them ineligible for some scholarships. Since the official admission into the masters program does not happen until the undergraduate program is finished, this does not impact the SGUS student in the same way.

**Addendum:** Current CUGS students will complete their CUGS program.

No new admissions will be allowed into the CUGS program once the SGUS program begins.

We will request termination of the existing CUGS program when all current students have graduated.

# Proposal for SGUS Program in CSE/EECS January 2010

The five year Sequential Graduate/Undergraduate Study (SGUS) program in the Computer Science and Engineering Program combines undergraduate study in an approved field with graduate study in the CSE Graduate Program.

Undergraduate programs in Computer Science, Computer Engineering Computer Science in Engineering, Electrical Engineering, Informatics and those with a minor in Computer Science are eligible for application into a SGUS program in Computer Science and Engineering.

MS/MSE Computer Science and Engineering / BS/BSE in Computer Science  
MS/MSE Computer Science and Engineering / BS/BSE in Computer Science in Engineering  
MS/MSE Computer Science and Engineering / BS/BSE in Computer Engineering  
MS/MSE Computer Science and Engineering / BS/BSE in Electrical Engineering or  
MS/MSE Computer Science and Engineering / BS in Informatics  
or a MS/MSE Computer Science and Engineering / BS/BSE with a Minor in Computer Science

This Sequential Graduate/Undergraduate Study (SGUS) program allows students to complete requirements for both degrees in five years. Many students who enroll in this program plan to enter industry but seek additional intellectual depth beyond the bachelor's degree. Students who plan to pursue a PhD should apply directly to PhD program.

## **Admission Information:**

1. Students apply early in the second term of their Junior year for admission into the program in order to be advised appropriately regarding planning for undergraduate and graduate course selections.

2. The application is a two step process.

**Step One:** Provisional admission (applying by the deadlines).

- a. Fill out and return the CSE admission form for SGUS, available in the CSE Graduate Office. (do not apply online at this time. )
- b. Three letters of recommendation
- c. A personal statement
- d. A statement of purpose
- e. An unofficial copy of your transcript
- f. Filled out plan of study (include courses that you would like to take for double counting. This will be reviewed and updated upon admission and after as needed.)

**Step Two:** If provisionally admitted, the student will need to fill out the Rackham online application and submit it online at the beginning of the last term of undergraduate coursework. This will initiate your recorded "official" admission into the Rackham Graduate School and the CSE Program.

Admission to the SGUS program for a masters degree is decided by the CSE Graduate Admissions Committee and the Rackham Graduate School.

Upon provisional admission, the student will work with the CSE Graduate Coordinator and the SGUS Student

Advisor to fill out the Intent to Enroll form for provisional admission into the CSE Graduate Program. The purpose of the Intent Form is to outline a preliminary course of study enabling the student to make appropriate course selections while satisfying undergraduate requirements. The student will need to update the SGUS masters plan of study when necessary.

3. Students must have a minimum cumulative GPA of at least 3.6 at the time of the CSE application and at the time of regular admission to the Rackham Graduate School. GRE (General) scores are not required, but will be considered if provided. GRE scores are required for admission to the regular CSE M.S.E. and Ph.D. programs. If a student is seriously considering pursuing a Ph.D., the GRE test should be taken during the senior year. This also facilitates applications for major national graduate fellowships from the National Science Foundation, etc.

Students must apply for admission no later than the second term of their junior year (and have 80+ hours the term they begin the program).

To begin SGUS in Fall term (first term of your senior year)—deadline is May 1

To begin SGUS in Winter term (first term of your senior year)—deadline is October 1

**Pre-requisite Requirements:**

All applicants should have completed EECS 281 or EECS 382 AND EECS 270 or 370, with a grade of B+ or better.

**Degree Information:**

1. All credit hour and course requirements of the BS/BSE degree must be met. Students with dual major/dual degree undergraduate degrees are not eligible for SGUS

2. All 30 credit hours and all course requirements of Computer Science and Engineering MS/MSE degree must be met.

3. SGUS students must enroll in Rackham for two at least two full terms, paying Rackham tuition.

4. Up to nine hours of prior-approved coursework may be double-counted toward each of the two degrees. Courses may not be split for the double count or for transfer. Double-counted hours may *not* include any core courses required for the BS/BSE degree, but may include courses elected to meet technical or general electives required for the BS/BSE degree.

All double-counted hours must be acceptable for Rackham and Graduate Program credit (non-core CSE/EECS 4xx or CSE/EECS 5xx or CSE/EECS 6xx courses, or courses in other departments at the Rackham graduate level).

Rackham approved courses are online at [https://secure.rackham.umich.edu/academic\\_information/programs/](https://secure.rackham.umich.edu/academic_information/programs/)

**Comments:**

1. Student must meet all Rackham requirements for the SGUS degree. Please refer to their information regarding their rules.

2. By Rackham requirement, students must be within 6 credits of completing their undergraduate degree to enroll in an MS/MSE program. This means that you may apply (step two above) for Rackham admission at this time.

3. A maximum of 15 credit hours may be double counted or transferred for graduate credit, including a maximum of 9 credit hours double counted towards each of the two degrees and a maximum of 6 credit hours transferred from the undergraduate to graduate record. Courses cannot be split. Credit transferred could not be double counted towards the credits needed for the BS/BSE.

4. Each degree may be awarded upon completion of requirements for the degree. You should graduate with your B.S.E. degree at the end of the term in which your degree requirements are met. You must complete the B.S.E. degree within one semester of enrolling in the SGUS program.

**CONTACTS**

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To: Marina Epelman , Chair, CoE Curriculum Committee  
From: John R. Barker, Chair, AOSS Undergraduate Curriculum Committee  
Subject: **AOSS Program Change: Establish a New Departmental Concentration**  
Date: January 25, 2010 (Revised February 8, 2010)

We request approval for a change to the undergraduate program in AOSS. Our program is called Earth System Science and Engineering (ESSE) and it currently includes three concentrations: Meteorology, Climate Science, and Space Weather. We propose the addition of a fourth concentration: Climate Impact Engineering. Details about the new concentration are provided below.

### **Climate Impact Engineering Concentration**

#### **Objectives**

Climate change is one of the most important societal issues now facing us. There is a need for scientists and engineers to carry out evaluation and engineering activities (i.e. those that require engineers) that require expertise both in climate science and in the engineering disciplines. These include issues related to air quality, energy engineering, sustainability, and water resources. In addition, there is also a need for people trained in both climate science and in governmental policy and law, among others. The proposed new concentration will provide training in the fundamentals of Earth system science, through the AOSS undergraduate core courses, and will provide an introduction to aspects of other fields through a set of approved concentration courses. As a result, the students will be prepared broadly to assess the impacts of climate change on engineering activities and in the realm of policy and law. The proposed concentration is intended to provide the necessary training.

A second objective of this proposed concentration is to attract undecided COE undergraduates to careers in climate science and engineering. A substantial fraction of COE graduates pursue non-traditional careers. The proposed Climate Impact Engineering concentration is designed to be highly flexible, enabling students to in essence design their own programs. This proposal is broadly consistent with “Michigan Engineering 2020”, the 2009 report issued by the Commission on Undergraduate Engineering Education: Curriculum for the 21<sup>st</sup> Century. This plan will also, we hope, boost enrollment in AOSS.

## **Description**

AOSS has a set of core courses required of all ESSE majors. This core, along with technical electives, provides a thorough introduction to the science of climate change. The aim of the new concentration is to provide education in both climate science and in a second area of expertise, such as the traditional engineering disciplines, policy, or law. In this new concentration, AOSS will provide the education in climate science, but it cannot provide training in other area. For that reason, students will take courses from other departments to supplement the AOSS core courses. This concentration is not intended to replace dual degrees, but to provide a broadly based education both in climate science and in engineering, with the emphasis on climate science.

Concentration courses are to be taken in pairs selected by the student from among the approved Climate Impact Pairs in order to promote some depth of study in particular aspects of engineering or other fields that are likely to be affected by climate change. With permission of an AOSS undergraduate advisor, a group of four or more concentration courses in one of the engineering disciplines or other fields may be chosen in place of the two selected Climate Impact Pairs. In addition, each student will be required to take ENGR 450 Multidisciplinary Design and AOSS 480 Climate Change: Move to Action. ENGR 450 will provide the experiential course required by AOSS, and both courses will serve as capstones, which help to pull together the two strands of this proposed new concentration.

## **Other Considerations**

Because of restricted enrollments in some courses outside of AOSS, our students may have difficulty in enrolling in all of the concentration courses that are listed below. In part to alleviate this potential problem, more options are provided than are probably required, and AOSS will seek cooperative arrangements with the other departments. If future experience shows it to be necessary, AOSS will restrict enrollment in the new concentration.

### Breakdown of Required Credits

Subjects required by COE for all students	55 cr
AOSS Required Core Courses	28 cr
Concentration Courses + Electives	
AOSS 480 Climate Change: Move to Action	4 cr
ENGR 450 Multidisciplinary Design	4 cr
Concentration Pairs <sup>a</sup> + Technical Electives	26 cr
General Electives	11 cr
Total	128 cr

<sup>a</sup> Two pairs of courses must be selected from the Approved Climate Impact Course Pairs

### Required AOSS Core Courses (28 cr)

AOSS 320 Earth System Evolution
AOSS 321 Earth System Dynamics
AOSS 323 Earth System Analysis
AOSS 350 Atmospheric Thermodynamics <sup>a</sup>
AOSS 370 Solar-Terrestrial Relations
AOSS 380 Intro. to Radiative Transfer
AOSS 410 Earth System Modeling

<sup>a</sup> Alternatives: MECHENG 235 Thermodynamics, or CHE 330 Chem. Eng. Thermodynamics

### Approved Climate Impact Course Pairs (Choose 2 Pairs of Courses)

Pair	Credits	Courses
<b>Engineering Principles</b>		
<b>a</b>	3	CEE 230 Energy and Environment
	4	CEE 260 Environmental and Sustainable Engineering Principles
<b>b</b>	4	NRE 541 Remote Sensing for Environmental GIS
	4	NRE 531 Principles of GIS
<b>Policy and Law</b>		
<b>c</b>	3	NRE 558 Water Resource Policy
	3	NRE 559 International Environmental Policy and Law
<b>d</b>	4	EEB 320 Rivers, Lakes and Wetlands: Introduction to Aquatic Ecosystems
	3	EEB 380 Oceanography: Marine Ecology
<b>Marine Ecology</b>		
<b>e</b>	4	GEOSCI 284 Environmental Geology
	3	GEOSCI 325 Environmental Geochemistry



**Atmospheric, Oceanic and Space Sciences: Sample Schedule: B.S.E. in Earth System Science and Engineering.**  
 The proposed Concentration in Climate Impact Engineering is highlighted in red.

	Total Credit Hours	Term:							
		1	2	3	4	5	6	7	8
<b>Subjects Required by all Programs (55 hours)</b>									
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	-
Engineering 100, Introduction to Engineering	4	4	-	-	-	-	-	-	-
Engineering 101, Introduction to Computers	4	-	4	-	-	-	-	-	-
Chemistry 125/126, 130 or 210, 211	5	5	-	-	-	-	-	-	-
Physics 140 with Lab 141	5	-	5	-	-	-	-	-	-
Physics 240 with Lab 241	5	-	-	5	-	-	-	-	-
Humanities and Social Sciences	16	3	3	3	4	3	-	-	-
<b>Required Subjects (28 hours)</b>									
AOSS 320, Earth System Evolution	4	-	-	4	-	-	-	-	-
AOSS 321, Earth System Dynamics	4	-	-	-	4	-	-	-	-
AOSS 323, Earth System Analysis	4	-	-	-	4	-	-	-	-
AOSS 350, Atmospheric Thermodynamics <sup>1</sup>	4	-	-	-	-	-	4	-	-
AOSS 370, Solar-Terrestrial Relations	4	-	-	-	-	4	-	-	-
AOSS 380, Introduction to Radiative Transfer	4	-	-	-	-	4	-	-	-
AOSS 410, Earth System Modeling	4	-	-	-	-	-	-	4	-
<b>Concentrations: (select one)</b>									
<b>Meteorology Concentration (45 hours total)</b>									
AOSS 401, Geophysical Fluid Dynamics	4	-	-	-	-	4	-	-	-
AOSS 411, Cloud and Precipitation Processes	3	-	-	-	-	-	-	3	-
AOSS 414, Weather Systems	3	-	-	-	-	-	3	-	-
AOSS 422, Boundary Layer Meteorology	4	-	-	-	-	-	4	-	-
AOSS 462, Instrumentation for Atmos & Space Sciences	4	-	-	-	-	-	-	-	4
AOSS 440, Meteorological Analysis Laboratory	4	-	-	-	-	-	-	4	-
Technical Electives	12	-	-	-	-	-	6	-	6
General Electives	11	-	-	-	-	-	-	5	6
<b>Total</b>	<b>128</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>17</b>	<b>16</b>	<b>16</b>
<b>Climate Science Concentration (45 hours total)</b>									
AOSS 411, Cloud and Precipitation Process	3	-	-	-	-	-	-	3	-
AOSS 467, Biogeochemical Cycles	3	-	-	-	-	-	3	-	-
Additional Concentration Courses + Technical Electives	28								
Climate Science Experiential (1 course from approved list) <sup>2</sup>		-	-	-	-	-	-	-	4
Climate Components (3 courses from approved list) <sup>2</sup>		-	-	-	-	-	4	4	4
Technical Electives		-	-	-	-	4	-	-	8
General Electives	11	-	-	-	-	-	5	6	-
<b>Total</b>	<b>128</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>16</b>
<b>Climate Impact Engineering Concentration (45 hours total)</b>									
ENGR 450 Multidisciplinary Design	4								4
AOSS 480 Climate Change: Move to Action	4								4
Additional Concentration Courses + Technical Electives	26								
Climate Impact Sets (2 pairs of courses from approved list) <sup>2</sup>		-	-	-	-	-	7	7	
Technical Electives		-	-	-	-	4	-	-	8
General Electives	11	-	-	-	-	-	6	5	
<b>Total</b>	<b>128</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>17</b>	<b>16</b>	<b>16</b>
<b>Space Weather Concentration (45 hours)</b>									
AOSS 450, Geophysical ElectroMagnetics	4	-	-	-	-	-	4	-	-
AOSS 477, Space Weather Modeling	4	-	-	-	-	-	-	-	4
Additional Concentration Courses + Technical Electives	26								
Space Weather Experiential (1 course from approved list) <sup>2</sup>		-	-	-	-	-	-	-	4
Space Components (3 courses from approved list) <sup>2</sup>		-	-	-	-	-	3	7	-
Technical Electives		-	-	-	-	4	-	4	4
General Electives	11	-	-	-	-	-	6	-	5
<b>Total</b>	<b>128</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>15</b>	<b>17</b>	<b>15</b>	<b>17</b>

**Notes:**

<sup>1</sup> Alternatives: MECHENG 235 Thermodynamics or CHE 330 Chemical Engineering Thermodynamics

<sup>2</sup> See AOSS department web site for lists of approved courses: <http://aoss.engin.umich.edu/pages/undergraduate>